

dery polymethyl methacrylate was added to the mixture to form an adhesive composition. The composition was coated on the metal piece surface exposed through the circular hole of the cellophane tape and an acrylic resin rod having a diameter of 5 mm was vertically held and fixed on the coated surface of the metal piece. After one hour had passed, the cellophane tape was peeled off, and the acrylic resin rod-bonded metal piece was dipped in water maintained at 37° C. for a predetermined time. Then, the metal piece was taken out from water and the acrylic resin rod was pulled from the metal piece at a loading speed of 2 mm/min by using universal testing machine (Model IM-500) to determine the tensile adhesive strength.

For comparison, the above procedures were repeated in the same manner except that 4-methacryloxyethyltrimellitate anhydride was not used but methyl methacrylate alone was used. The tensile adhesive strength was determined in the same manner as described above.

Obtained results are shown in Table 2.

Table 2

Metal Piece	Dipping Time (days)	Tensile Adhesive Strength (Kg/cm ²)
Example 7		
Suncolium	2	above 145.9*
"	30	above 185.6*
Sunilium	6	above 103.1*
Brass	4	121.4
Gold-silver-palladium	30	76.9
Silver alloy	1	above 190.0*
Comparative Example 10		
Suncolium	2	22.8
Sunilium	6	67.7

Note

Suncolium: cobalt-chromium alloy for dental casting (manufactured by Sankin Kogyo)

Sunilium: nickel-chromium alloy for dental casting (manufactured by Sankin Kogyo)

Gold-silver-palladium: 12 % of gold, 20 % of palladium, 57.8 % of silver and 9.9 % of copper

Silver alloy: 60 % of silver, 25 % of tin, 10 % of copper and 1 % of palladium

*the adhesive layer of the acrylic resin rod was destroyed at the measurement of the tensile adhesive strength

EXAMPLE 8 AND COMPARATIVE EXAMPLE 11

An acrylic resin rod was bonded to a copper piece according to the procedures of Example 7. The copper piece was dipped in water maintained at 37° C. for 1 day, and it was then dipped in water maintained at 4° C. for 1 minute and in water maintained at 60° C. for 1 minute alternately. This alternate dipping was conducted 60 times, namely for 2 hours as a whole. At the measurement of the tensile adhesive strength, the acrylic resin rod was destroyed when a pulling force of 149.3 Kg/cm² was applied.

For comparison, the above procedures were repeated in the same manner except that 4-methacryloxyethyltrimellitate anhydride was not used but methyl methacrylate alone was used. The tensile adhesive strength was 37.6 Kg/cm².

EXAMPLE 9 AND COMPARATIVE EXAMPLE 12

In the same manner as described in Example 8 or Comparative Example 11, a stainless steel piece (SUS 304) and an acrylic resin rod were bonded together. It was found that the tensile adhesive strength was 105 Kg/cm² when 4-methacryloxyethyltrimellitate anhydride was used in combination with methyl methacry-

late (Example 9) and the tensile adhesive strength was 10 Kg/cm² when methyl methacrylate alone was used (Comparative Example 12).

EXAMPLE 10

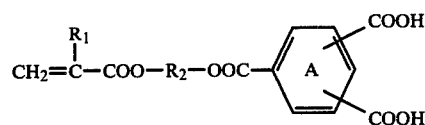
A liquid mixture comprising 63 parts by weight of Bis-GMA, 32 parts by weight of triethylene glycol dimethacrylate and 5 parts by weight of 4-methacryloxyethyltrimellitate anhydride was prepared, and 0.5% by weight of benzoin peroxide was added to the liquid mixture to form a homogeneous solution. The viscous liquid was coated on the surface of a stainless steel sheet (SUS 304) having a thickness of 1 mm, a width of 10 mm and a length of 100 mm, and the coated surface was lightly covered with a cellophane paper. The coated steel sheet was maintained in a thermostat tank maintained at 70° C. for 3 hours to form an adhesive layer. The, a methylene chloride solution of polymethyl methacrylate containing a small amount of a dye (Oil Red) was coated on the adhesive layer. Methylene chloride was evaporated to form a colored layer. The so treated SUS 304 sheet was dipped in water maintained at 50° C. for 1 month. The sheet was taken out from water and water was wiped away from the sheet. Then, an adhesive cellophane tape was applied to the colored layer, and the cellophane tape was violently peeled off while the SUS sheet was being firmly fixed. The colored layer was not peeled off but was held on the SUS sheet.

COMPARATIVE EXAMPLE 13

The procedures of Example 10 were repeated in the same manner except that formation of the adhesive layer was omitted. The colored layer-bonded SUS sheet was dipped in water maintained at 50° C. only for one day. When the cellophane tape was peeled from the SUS sheet, the colored layer was readily peeled off from the SUS sheet together with the cellophane tape.

What we claim is:

1. A curable composition comprising (A) an ethylenically unsaturated carboxylic acid represented by the following general formula:



wherein

R₁ is a hydrogen atom or a methyl group,

R₂ is an alkylene group having 2 to 4 carbon atoms, and in the benzene ring A, two carboxyl groups are bonded to carbon atoms other than the carbon atoms adjacent to the carbon atom to which the ester group is bonded,

or an acid anhydride thereof, (B) at least one ethylenically unsaturated monomer other than said monomer (A), said ethylenically unsaturated monomer (B) being copolymerizable with said monomer (A), and (C) at least one catalyst selected from the group consisting of free radical initiators and photosensitizers.

2. A curable composition as set forth in claim 1 wherein the ethylenically unsaturated carboxylic acid is 4-methacryloxyethyltrimellitate.

3. A curable composition as set forth in claim 1 wherein the acid anhydride is 4-methacryloxyethyltrimellitate anhydride.